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## SOME EXPERIMENTS IN FEEDING LIZARDS WITH PROTECTIVELY COLORED INSECTS.<sup>1</sup>

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During the past year, from October to May inclusive, I have been experimenting with insects that possess protective, mimetic and warning colors or that have some disagreeable characteristics which in a measure are supposed to prevent their being devoured by insect-eating animals. For this purpose several species of lizards found in the vicinity of Austin, Texas, have been kept in separate, convenient cages and fed with the various insects. Some interesting observations on the habits of the lizards were made incidentally and these are also noted in the following paper.

The species of lizards used for the experiments are the following: *Gerrhonotus infernalis* Baird, *Chrotaphytus collaris* Say, *Sceloporus floridanus* Baird, *Holbrookia texana* Troschel, *Cnemidophorus sexlineatus* Linn., *Phrynosoma cornutum* Harl., and an undetermined species of *Eumeces*.

### EXPERIMENTS WITH SCELOPORUS FLORIDANUS.

#### LEPIDOPTERA.

*Anosia plexippus* Linn. This species is conspicuously colored in light brown with black and white markings. It is also said to have a disagreeable taste and is the supposed model of the mimic *Basilarchia disippus*. Specimens were introduced October 31, November 6, April 2 (two), April 4, April 6. Each time the butterfly was caught by the wing, or by the wings if folded, held for a few moments and then eaten slowly. It was not torn to pieces but held by part of the wings and swallowed gradually, the lizard often pausing a moment to rest.

*Papilio (Laërtias) philenor* Linn. Formerly this was included in the genus *Papilio* but has been separated because of characteristic differences, important among which is the supposition that it is an especially protected form because its larva feeds on *Aris-*

<sup>1</sup> Contribution from the Zoölogical Laboratory of the University of Texas, No. 52.

*tolochia*, a poisonous plant of disagreeable taste. On October 30, March 27, March 30 (two), March 31, April 1 (three), April 4, April 16, April 23, May 4 (four), May 6 (two), butterflies were introduced into the cage and quickly eaten by the lizards with evident relish. On May 6 one of the specimens was badly mutilated and the lizards were not induced to take it for more than an hour.

*Pieris occidentalis* Reakirt. October 29, April 20 (three).

*Pieris protodice* Boisd-Lec. April 23, May 1 (four). These forms, white with black markings, were readily eaten.

*Colias eurytheme* Boisd. November 8 (two), March 31 (two), April 9, April 20 (seven), April 23 (five), May 1 (two). All quickly eaten.

*Colias ariadne* Edwards. April 16 (two).

*Colias scuddere* Reakirt. April 20, May 1 (two). These species are of striking yellow or orange marked with black, a typical warning combination, yet all were eaten eagerly.

*Pyrrhanæa andria* Scudder. This form is admirably protected by having the under side of the wings an exact imitation of a dead leaf. The wings are held folded closely together when the butterfly is at rest, and it remains motionless in this position for a great length of time. It is one of the most perfect instances of protective resemblance that I have obtained. Specimens were introduced November 14, April 22 (two, ♂ and ♀) and April 27. On April 22 the butterflies were not noticed at first. Several times they were offered to the lizards; the male was taken in about five minutes and the female ten minutes later. On April 27 the butterfly was seized by the wings several times, then dropped again. It remained motionless unless I moved it and the lizard would then seize it again. Finally it was abandoned, but it had disappeared the next day and probably had been eaten at last.

*Pyrameis atalanta* Linn. November 29. This is a conspicuous form, of black, brown, red and white. The lizards ate it eagerly.

*Pyrameis huntera* Fabr., a similar form but having large eye-spots underneath the wings. It was eaten May 1.

*Grapta interrogationis* Fabr. April 1. This species also has the under side of the wings in imitation of a dead leaf, and is

very difficult to detect when at rest. It is in the habit of remaining motionless for a long while. The specimen introduced was at once eaten.

*Papilio cresphontes* Cramer. One specimen was introduced April 23 and four lizards at once seized the outspread wings. They showed no preference for the body but ate the wings first, as is usually the case. On May 7 the wings of the specimen introduced were almost entirely eaten when the lizard happened to drop it. It remained quiet, and the lizard would only take it again after I had made the butterfly move several times.<sup>1</sup>

*Deilephila lineata*. May 5. Two of these Sphingid moths were introduced and seized at once. They fluttered continuously and thus frustrated the attempts of several other lizards that were trying to participate. One moth was held by the head, the other by the wing for quite a while, till they ceased fluttering, and were then eaten.

*Species unknown*. May 4. This small moth is of black and orange, the typical warning coloration. It was eaten at once without any symptoms of dislike being shown.

#### HEMIPTERA.

*Lygaeid*. May 5. Just after the above-mentioned moth was eaten four of these bugs were introduced. They are of the typical black-and-red or orange warning colors and have a very disagreeable odor. The same lizard that ate the moth at once seized a bug, chewed it a moment and spit it out, then licked his mouth for some time as if to remove the bad taste. Another lizard examined a second bug but made no attempt to take it. One bug was eaten later by the third lizard and the other two were gone next morning. May 13 a bug was introduced, seized at once and then rejected as before. It is evidently quite unpalatable.

*Brachymena myops*. Three were introduced November 8, but were never noticed by the lizards. The bug is gray in color,

<sup>1</sup> A glass jar containing live butterflies was placed on a chair about two and one half or three feet from the cage of *Sceloporus*. A large male lizard immediately climbed up the side of the cage, eyed the butterflies eagerly and seemed quite excited. This happened a few days later with several of the lizards. When the insects were introduced they were seized and eaten at once, several lizards quarreling over a desirable specimen and sharing it among themselves.

quite similar to the bark of trees that it frequents, and possesses a very unpleasant odor.

*Fulgorid.* Introduced November 5, November 6. This lantern fly is almost impossible to detect when at rest upon the trunks of the cedars and arbor-vitæ which it frequents. The upper wings and exposed portions of the head and thorax are somber gray, the almost transparent wings showing a tinge of pink when spread. The under wings are either entirely black or have a small white spot near the center. The posterior dorsal portion of the abdomen is bright red or deep orange, the remaining portions of the body being black. The insect shows perfect protective coloration at rest and a rather typical warning combination in flight. The insects were eaten at once by the lizards when seen in motion.

#### COLEOPTERA.

*Chauliognathus scutellaris* Lec. Although this beetle is colored black and yellow it appears to be palatable. May 1 five were introduced. The first was taken by the lizard that sampled the *Lygæid*, tasted a little, and rejected. However three others were eaten by a second lizard and the last beetle by a third. May 4 twenty beetles were introduced and all were eaten without any evidences of unpalatability. On May 5 four were introduced just after the four *Lygæids*. The first was carefully examined before being eaten; the second was tasted and refused by another lizard; the others were not noticed, as was also the case when seven were introduced the following day. The lizards were probably too well fed, for since then, May 11 and 13, they have eaten all that were offered.

*Epicauta* sp. November 3. This black blister-beetle was tasted and rejected immediately. Unfortunately no more specimens were found.

*Zopherus haldemani* Sallé. This very hard Tenebrionid beetle, conspicuously colored in black and white, was introduced November 9 and removed alive December 13 during which time no attempt to take it was seen. Specimens experimented with November 12 and May 5 gave the same results.

*Lucanus dama* Thumb. This black, horny beetle was introduced November 17 and died January 7; during this time the lizards never tried to take it.

*Harpalus caliginosus* Fab. This beetle is large, black and rather hard, nevertheless one was eaten December 2, one December 12 and another partly eaten January 8. Four remained dead at this date. Their odor is offensive.

*Brachynus* sp. When seized this beetle ejects a strong, volatile acid with a sharp, audible report. This always surprised the lizards; nevertheless, of the four beetles placed in the cage three were eaten, but the last refused. Two more were introduced February 26 and one March 5, which afterward disappeared and presumably were eaten.

*Brachynus* sp. April 3. This beetle, larger than the preceding species, was eaten at once.

*Calosoma angulatus* Chev. and

*Pasimachus depressus* Fab. were introduced March 17. The lizards attempted to catch them, but failed, and soon gave up the chase.

*Chlaenius orbus* Horn. The odor of this beetle is quite offensive. March 9 one was eaten at once. On March 10 two lizards tried to catch a specimen but failed repeatedly. They appeared to notice the odor and gave up the chase. On March 23, however, the lizard that ate the former now ate another, and still a fourth was eaten April 3, but with evident disgust.

*Cantharis fulvipennis* Lec. This large blister beetle has the typical warning colors of black and yellowish-brown and is further protected by a disagreeable secretion that exudes from the joints of the legs when the insect is seized and which is capable of producing blisters. Four of these beetles were introduced May 19 and each was seized at once, then quickly shaken off. The lizards eyed the beetles intently, but made no attempts to take them. These specimens were removed and introduced again the following day. Only one beetle was taken this time and it was quickly rejected. On May 21 several beetles were again introduced. One was caught and quickly rejected and no further notice was taken of them unless they crawled upon the lizards, in which case they were shaken off violently.

#### DIPTERA.

*Musca domestica* and *Stomoxys calcitrans*. A small lizard of this species (*Sceloporus floridanus*) soon became so tame that it

would lie on my hand and eat the flies which I caught and offered in my fingers. Sometimes he would catch the flies himself if I held him close to the window where they were crawling. He also ate a number of small spiders that were just emerging from the egg case placed in a glass jar. The lizard was kept in a cage with adults of the same species and was possibly eaten by them, as no trace of him could be found, and these lizards had, on two other occasions, been suspected of devouring small lizards.

#### HYMENOPTERA.

*Pogonomyrmex barbatus* var. *monefaciens*. These ants were eaten October 29, November 3, November 22 and May 24. The sting is quite severe.

*Pachycondyla harpax*, a stinging Ponerine ant, was eaten October 28.

*Polistes annularis*, a formidable wasp, was not noticed November 5.

#### ORTHOPTERA.

*Gryllus abbreviatus*. Several of these crickets were eaten March 7 and March 11. It is therefore probable that those introduced November 9, January 18, and January 19, were also eaten, since crickets seem to be a favorite food with all the species of lizards.

#### NEUROPTERA.

*Panorpa nuptialis* Gerst. This species has the wings of typical black and yellow warning colors. A female was introduced November 9 and a male November 15. Both disappeared in some way, but were not seen to be eaten.

#### ARACHNIDA.

*Epeira fasciata* Hentz. This protectively colored specimen was eaten October 25 and a second November 6.

#### SCORPIONS.

*Centrurus carolinensis* Beauv. On March 23 the specimen which was introduced stung one of the lizards. He appeared to be in much pain and was so frightened at the scorpion that the experiment seemed likely to terminate there, but suddenly he seized the offending sting in his mouth and spitefully devoured the

whole specimen. The color of this scorpion would seem to afford it efficient protection. This, together with its flat form, frequently prevents its being noticed by a casual observer when the stone under which it rests is overturned.

#### MYRIOPODA.

*Julus (Spirobolus) multistriatus* Walsh. The specimen introduced November 15 was not molested, but when two were introduced February 12 a lizard bit off part of the head of one *Julus*. Both specimens died after a few days, neither being eaten. This myriopod has a hard integument and is defended by means of an acrid secretion that is thrown out from the repugnatorial glands along each side of the body. It has the habit of coiling up and remaining quiescent whenever it is touched. This action makes the lizards suspicious of it.<sup>1</sup>

#### EXPERIMENTS WITH GERRHONOTUS INFERNALIS BAIRD.

The favorite foods of these lizards are crickets, grasshoppers, spiders and scorpions. A few Hemiptera were eaten also.

#### LEPIDOPTERA.

*Anosia plexippus* Linn. April 1, April 2, April 4 (three). None of these specimens were eaten.

*Papilio (Lærtias) philenor* Linn. March 26, March 30, April 6. All were examined and rejected.

*Pyrameis cardui* Linn. November 17. Offered and refused.

*Pyrrhaneæ andria* Scudder. November 9. Refused.

*Colias eurytheme* Bois. March 30, April 1 (three), April 6. On the latter date the butterfly was taken by the wings but soon dropped, and all others were refused entirely.

<sup>1</sup> *Sceloporus floridanus* is badly infected with an interesting mite which attaches itself under the scales of the lizard until sexually mature and then crawls up on the wooden part of the cage to oviposit. The eggs are placed in a peculiarly constructed palisade and hatch as a six-legged larva that appears identical with the ordinary "red bug." The adult has a pubescent black integument; the head, anus and four pairs of legs are bright red. The legs are arranged in groups, two pairs being situated on the anterior portion of the body and two in the posterior region. Mr. Nathan Banks believes that this form may represent a new genus since it is the only lizard parasite that has been taken in this country, and appears to be closely related to the Italian genus *Geckobia*.



## ORTHOPTERA.

*Acridium americanum* Scudd. November 15, November 24, January 28, March 11, March 30. This large grasshopper is of a very somber, dusty color and extremely quick in flight. Whenever introduced into the cage it was at once eaten eagerly. The lizard seized the insect by the thorax, held it thus for some time, regrasped it more anteriorly several times until the head was taken into the mouth. The insect was then swallowed slowly, the lizard chewing a while, pausing to rest, then gulping down another portion. On one occasion when the grasshopper became somewhat crooked, although it was nearly completely swallowed it was disgorged, straightened, and then devoured again.

*Species unknown.* On November 29 a large grasshopper was eaten in the usual way. The body, legs and head were dark green; the wings brown. The whole body was ornamented with white or yellow spots and lines.

*Gryllus abbreviatus.* December 12, January 10 (five), March 7 (several), March 10 (two), April 6 (several). All the specimens were eaten eagerly.

## NEUROPTERA.

*Panorpa nuptialis* Gerst. November 9. Although this warningly-colored insect remained in the cage six days, no attempt was made to seize it.

## COLEOPTERA.

*Lucanus dama* Thunb. November 8, was not eaten.

*Zopherus haldemani* Sallé. November 9, was refused.

*Harpalus caliginosus* Fab. December 11 and December 18. Five specimens were introduced, and all died.

*Brachynus* sp. February 12. Two of these beetles were introduced and were not noticed by the lizards, though offered repeatedly. They run very swiftly, hiding at every opportunity, and the lizards are probably too slow in their movements to catch so quick a prey.

*Patrobus longicornis* Say. The beetle was introduced February 13, and remained until March 5, but no attempt was made to take it.

*Diabrotica punctata* Oliv. February 13. These green-and-black beetles were probably too small for the lizards to perceive.

*Chlœnius orbus* Horn. March 7. One of the lizards ran up to examine the beetle but when near turned aside, evidently discouraged because of the disagreeable odor, and did not try again to take it.

*Pasimachus depressus* Fab. March 17. The beetle was examined and refused.

*Calosoma angulatus* Chev. April 6. The beetle seemed never to have been noticed.

*Chauliognathus scutellaris* Lec. May 4. The lizards seemed to pay no attention to the beetle although fifteen specimens were introduced.

*Cantharis fulvipennis* Lec. Two specimens of this black-and-yellow blister beetle were introduced May 19. One was seized at once by one of the lizards, chewed a moment, then dropped quickly. The lizard began writhing and rubbing his mouth in the sand, appearing much distressed. The second beetle was not noticed by any of the lizards and was removed. On May 20 they eyed the beetle that was introduced, but made no attempt to take it. May 21, the specimen seemed not to be noticed. Others introduced May 26 gave the same negative result as the preceding experiment.

#### HEMIPTERA.

*Brachymena myops*. December 1, January 24. This protectively colored, malodorous form was not noticed by the lizards.

*Lygæid*. May 5. Two specimens of this warningly colored bug were introduced, examined and refused.

*Fulgorid* sp. November 5, November 6. Several specimens were eaten with evident relish. The bug was never refused if alive, but never eaten if dead.

#### HYMENOPTERA.

*Polistes annularis*. Linn. November 4, refused.

*Camponotus sansabeanus* Buckley. November 29 and *Camponotus festinatus* Buckley. April 13. These ants were possibly too small to be noticed.

## ARACHNIDA.

*Lathrodectes mactans*. November 17, November 29, December 6 (two), December 18 (four), January 20 (two), February 2 (two), March 9, March 11, March 17, March 25, March 30, April 6, April 13 (four), April 20 (three), May 19 (two). These spiders are of a jet black color conspicuously marked with crimson or sometimes white, thus exhibiting striking warning coloration. They are even said to be poisonous, yet they were always quickly seized and eaten by these lizards.

*Attus mystaceus*. December 10, December 12 (two). The somber gray color of these spiders affords them good protection under the stones where they live. They were eaten eagerly.

*Lycosa* sp. March 9, March 23 (two), March 25. This spider resembles very closely in color the under side of the stones where it is often found. It was eaten at once when introduced.

## SCORPIONS.

*Centrurus caroliniensis* Beauv. January 20, March 17, March 23 (two), April 13 (three), April 20 (six), April 27 (five), May 4, May 18 (six), May 19 (two), May 25 (two). All these specimens were eaten with evident relish and no attention was paid to the sting. The hard integument of the lizard prevents the penetration of the sting.

## MYRIOPODA.

*Julus* (*Spirobolus*) *multistriatus* Walsh. The specimen was introduced November 18 and died January 7. It was not noticed by the lizards, as was also the case with two specimens introduced February 12.

## EXPERIMENTS WITH CROTAPHYTUS COLLARIS Say.

Two of these lizards were captured November 9 and were not seen to eat a single insect until February 12. Various kinds of insects were placed in the cage, and though the lizards were quite tame and lively they would not eat. On January 23 a dish of water was placed in the cage and they learned to drink from the dish and also from the pipette used for refilling it. The water furnished their only nourishment for three months. A third lizard was captured April 4 and though very fierce at first,

became quite tame in about a week, allowing me to rub its head and body with my hand. These lizards occupied the cage with *Gerrhonotus infernalis* until December 1 when they were placed in a separate one. The experiments were as follows :

#### LEPIDOPTERA.

*Meganostoma eurydice* Boisd. December 15, was not eaten.

*Papilio* (*Lærtias*) *philenor* Linn. March 26, March 30. These were not noticed and were afterward removed. The specimen introduced April 2 was found dead and apparently unharmed the following day. On April 7 the specimen introduced the previous day was gone, and on April 8 the lizard last caught was seen eating a butterfly. On April 21 a specimen was introduced and only a part of the wings remained next day. However, the two specimens introduced on May 4 remained in the cage two days and were not eaten.

*Colias eurytheme* Boisd. March 30. The specimen was not noticed by the lizards and was removed next day. The two that were introduced April 1 were gone the day following and of the two introduced April 2 one was entirely eaten and only the torn wings of the second remained. On May 8 one of the lizards seized the specimen just introduced by the edges of the folded wings and ate it slowly, often pausing to rest, but never releasing it.

*Anosia plexippus* Linn. Introduced April 2. Next day the head and thorax were chewed up and one fore wing was missing. Others that were introduced afterward disappeared but were not seen when eaten. But on May 18 the butterfly was seized at once by one of the lizards and a second lizard bit off part of a wing. Between them they ate the specimen, but did not take the two introduced May 25.

*Pieris occidentalis* Reakirt. April 16, was eaten.

*Grapta interrogationis* Fabr. The specimen introduced April 27 was eaten, and those placed in the cage May 7 and May 9 were gone the following mornings. Probably they were also eaten.

*Papilio cresphontes* Cramer. April 23. This butterfly did not seem to be noticed by the lizards.

*Anosia berenice* var. *strigosa* Bates. This butterfly has the same warning coloration scheme as *Anosia plexippus*. It had disappeared next day and was probably eaten.

#### COLEOPTERA.

The following specimens were introduced, but none of them were eaten and were rarely ever noticed by the lizards, though offered repeatedly :

*Harpalus caliginosus* Fab. December 2.

*Brachynus* sp. February 13 (three).

*Chlœnius orbis* Horn. March 7, March 23, April 3.

*Micryxys distinctus* Hald. March 7. This beetle was evidently too small for the lizards to perceive. They pay no attention to small insects, possibly because their eyes are not capable of perceiving them.

*Chauliognathus scutellaris* Lec. May 4 (eighteen), May 5 (six). All refused.

A notable exception to this custom of refusing beetles was seen when three black-and-yellow blister beetles, *Cantharis fulvipennis* Lec., were introduced May 19. A lizard seized one of the beetles and ate it, then seized a second. One of the other lizards tried to take it from the former, but was unsuccessful, and the second beetle was eaten. The third was apparently not noticed by any of the lizards and was soon removed. Specimens were introduced May 20, May 21 and May 26, but did not seem to be noticed.

Occasionally larvæ of beetles were introduced and eaten, but with the above exception these lizards do not appear to feed on imaginal Coleoptera. *Cantharis* probably does not appear in the natural habitat of the lizard, the latter being a mountain species, while the beetle is found in the fields on the Mexican poppy (*Argemone mexicana*).

#### ORTHOPTERA.

*Gryllus abbreviatus*. February 12 three specimens were introduced, one of which was dead, and was at once seized and eaten by a lizard. This was the first food it had taken since its capture, November 9, and it is the only instance known of a lizard eating a dead insect. The two remaining crickets disappeared

later and were evidently eaten. On March 23 one of the lizards tried repeatedly to catch one of the five crickets introduced, but failed, and finally gave up the chase, even refusing the insect when it was held before him in the forceps. The lizards were seen to catch and eat crickets on the following days: April 13 (two); April 20, April 27 (two), and on several occasions specimens that were introduced in the evening had disappeared by the following morning. Indeed, crickets seem to form the principal food of these lizards.

#### NEMOPTERA.

*Panorpa nuptialis* Gerst. December 12. This warningly-colored insect was apparently not noticed and died soon afterward.

#### DIPTERA.

*Hermetia illucens* Linn. December 13. This form resembles a wasp somewhat closely. It was not noticed by the lizards.

#### HEMIPTERA.

*Lygaeid* sp. May 5. The lizards could not be induced to take the specimens.

#### HYMENOPTERA.

No experiments with Hymenoptera were made with these lizards.

#### ARACHNIDA.

*Attus mystaceus*. December 1. This spider was not noticed though offered repeatedly.

*Lathrodectes mactans*. Specimens were introduced January 20 (three), March 23 (two) but none were eaten.

Other small spiders (names unknown) were introduced at different times but were never eaten.

#### MYRIOPODA.

*Scutigera forceps*. December 18. Specimen refused.

#### SCORPIONS.

*Centrurus caroliniensis* Beauv. November 15. The scorpion stung one of the lizards and it seemed to suffer so intensely and was so frightened whenever the former came near it that the experiment was never repeated.

Three other species of lizards were placed in the same cage with *Crotaphytus collaris*, from which the following results were obtained :

1. *Cnemidophorus sexlineatus* Linn. One specimen was caught December 1 and died January 7 during which time it was never seen to take any food. This was also the case with two small lizards of this species that were in the cage with *Sceloporus*. They disappeared mysteriously and are supposed to have been devoured. The lizard is quite common, but difficult to catch, and it is regretted that more were not obtained for the experiments.

2. *Holbrookia texana* Trosch. Two of these lizards were placed in the cage early in April and have never been seen to take any food.

*Eumeces* sp. This small lizard was captured March 12. On March 30 it tore up and ate the body of a butterfly, *Pieris occidentalis* Reakirt. April 6 it caught, tore to pieces and ate a cricket larger in circumference than itself. April 8 it ate a large house fly and on April 10 a number of small mantids, *Stagmomantis carolina*, recently hatched. The lizard was very alert, spying the mantids at a distance of several inches, though the latter were quite small and exactly the color of the sand on the floor of the cage. On April 23 and May 8 other young mantids of the same size were eaten.

*Phrynosoma cornutum* Harl. The "horned toads" were kept in cages with other lizards and also separately and were never seen to eat anything but ants. They are especially fond of the large agricultural ant, *Pogonomyrmex barbatus* Smith var. *molefaciens* Buckley.

#### GENERAL SUMMARY.

1. Only one instance is known of a lizard eating a dead insect.
2. Insects that move slowly do not attract the attention of the lizards so much as do the more active forms, hence those that remain quiescent are rarely even attacked.
3. Insects below a certain size are apparently not perceived by the large species of lizards. Examples of such insects are *Diabrotica punctata* Oliv., *Micryxis distinctus* Hald., and various ants (*Camponotus*).

4. Large beetles having hard elytra are seldom eaten.
5. A butterfly with mutilated wings was not taken for an hour and a half although another perfect specimen introduced at the same time was eaten at once.
6. If an insect (*e. g.*, a beetle) falls upon its back the lizards rarely ever seize it until it has gotten upon its feet again.
7. The myriopod *Julus* was not eaten by any lizard.
8. Although the combinations of black and yellow, black and orange, or black and red are supposed to serve the purpose of warning coloration, all insects possessing these colors were, at one time or another, eaten, with the possible exception of *Panorpa nuptialis* Gerst and a malodorous *Lygaeid* bug.
9. *Sceloporus floridanus* is perhaps the most satisfactory lizard for these experiments since it eats insects of all groups.
10. *Sceloporus* seizes any part of the insect, but as a rule only the wings of the butterflies and large moths.
11. All the lizards except *Eumeces* seize the insect with the mouth and swallow it a little at a time, never biting off pieces, but keeping the insect entire. *Eumeces* swallows its prey thus if small, but when the insect is large he shakes and pulls it to pieces with his mouth and eats the separate pieces.
12. *Sceloporus* is very active and is not easily tamed.
13. *Gerrhonotus* is exceedingly slow in capturing its prey. It creeps up stealthily, pauses when quite near, examines the insect by protruding the tongue, rises as high as possible on the toes of the fore limbs and then seizes the insect by the back with a sudden spring. If the insect does not move it is frequently left unmolested. This lizard soon becomes quite tame but does not enjoy being handled. It was seen to drink water from the dish by lapping with the tongue, but usually preferred taking it from the pipette, allowing me to place a drop at a time on its out-stretched tongue.
14. *Eumeces* sometimes drinks by *lapping* with the tongue, sometimes by sucking up the water. *Sceloporus*, *Crotaphytus* and *Phrynosoma* drink by *sucking* the water into the mouth. At first *Sceloporus* and *Crotaphytus* would drink only from the pipette, but were gradually induced to follow that to the dish and drink from the latter.



15. *Phrynosoma cornutum*, though apparently quite tame, seems at first rather shy about eating in confinement. Ants, especially the agricultural ants (*Pogonomyrmex*), are its only known food.

16. *Crotaphytus* is not accurate in seizing its prey. It often fails repeatedly and gives up the attempt.

17. The larger lizards were several times suspected of having eaten smaller specimens that had been placed in the same cage.

18. *Crotaphytus* soon becomes quite tame and enjoys being petted. The smaller ones crawled upon my hand in the cage and refused to be put down.

19. The largest *Crotaphytus* shed its skin during the night of May 6. Next morning the sand in the cage was very much dug out and heaped up, but no traces of the skin could be found.

20. A *Gerrhonotus* shed during the night of April 29. The old skin was turned wrong side out and probably came off nearly whole, though several parts were broken when it was found next morning. A second lizard shed May 22 and I watched it pull the old skin off wrong side out by creeping round and round the cage close to the sides. The skin was loosened first from the upper and lower jaws along the sides of the mouth, and began to peel off backward by the lizard's rubbing its head against the sand on the bottom of the cage.

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